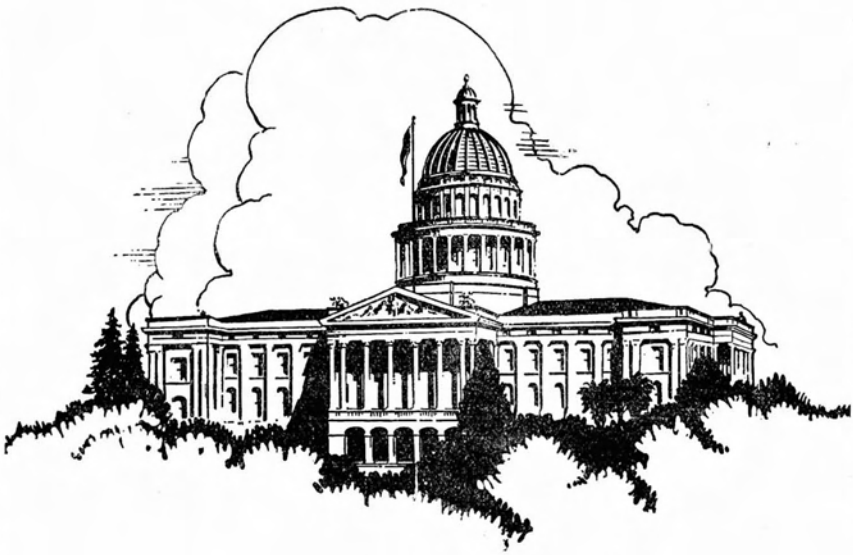
Volume XXV Number 2

BULLETIN

OF THE

DEPARTMENT OF AGRICULTURE

STATE OF CALIFORNIA



Sacramento, California : : : : April, May, June, 1936

31498

CALIFORNIA MICROLEPIDOPTERA IX

By H. H. KEIFER, State Department of Agriculture, Sacramento

THERE has been an increasing economic interest in certain small moths of the genus *Gnorimoschema* that are attached to various Solanums. This interest is especially noticeable throughout the West and centers around the Tomato Pin Worm, *Gnorimoschema lycopersicella* Busck. This little species is thought by some to be a threat to all tomato-growing areas. There is evidence now in the literature tending to support the philosophy that the Pin Worm can not survive in areas where winter temperature forces hibernation. Tomatoes are grown in many such places. But so far as the writer is aware, the ability of this moth to hibernate has not been definitely determined. So we remain open minded.

Perhaps the Lepidopterous insect in the West which accounts for most of the damage to tomatoes is the Tomato Fruit Worm, *Heliothis obsoleta* (Fabr.). In the younger stages, *Heliothis* can be mistaken for the Pin Worm. Other Solanaceous feeders, notably the Potato Tuber Moth, are involved in this possibility of mistaken identity due to similarity of host, injury, or both. The taxonomy of *Heliothis obsoleta* is not within the province of this paper but a short larval synopsis of it as compared to the pin worm is probably in order. The following comparison is mainly by means of a 9 mm. *Heliothis* and a full-grown *lycopersicella*.

Heliothis obsoleta—Larva larger than *G. lycopersicella*, except in very early stages (reaching a length of 40 mm. or more). Color varying from green to dark brown but usually striped; setiferous body tubercules large, conical, usually black, setae long and stout; skin spinules conspicuous under a magnification of 50 diameters, giving skin a dark color; head not flattened, completely exposed, on transverse axis, adfrontal sutures ending in epicranial suture long before reaching occipital foramen; thoracic coxae contiguous; central prolegs with compound setiferous tubercle expanded over outer side of leg.

Gnorimoschema lycopersicella—larva never attaining a length of more than 7 mm., usually shorter; color green, overlaid gray, with conspicuous purple spots; setiferous tubercles small, dark, setae relatively short (in this comparison); skin spinules much smaller; head flattened, partly retracted, on horizontal axis, adfrontal sutures ending just before occipital foramen, no epicranial suture; thoracic coxae not contiguous, progressively wider apart; central prolegs with compound setiferous tubercle relatively small and restricted to outer base of proleg.

The genus *Gnorimoschema* has recently been extended by Mr. Busck, its founder, to include *Phthorimaea* Meyrick, over which it has priority. (See Proc. Ent. Soc. Wash. 33, p. 60, March, 1931.) Within the last few months the "Genitalia of the British Tineina" by F. N. Pierce and J. W. Metcalf, has appeared. This is the first complete work for any one area that has dealt with the genitalia of this group of insects. We have now an organized beginning toward adding the taxonomic criteria in the genitalia to the two main structural categories on which Tineine classification at present rests, namely, head parts and wings. We see the male genitalia of the British species of *Gnorimoschema* (treated by Pierce as *Phthorimaea*) dividing those species into two groups. On the other hand, the female genitalia

almost invariably contain a characteristic signum consisting of a single curved spine, or slight modification thereof, a rather distinctive feature in the family Gelechiidae. Thus the female genitalia, with the labial palpi and wing veination, argue for a conservative treatment of the group and further vindicate Mr. Busck's action.

The genus *Gnorimoschema* is abundantly represented in California. There are two types of bionomy shown by the species: 1. Leaf-rollers, leafminers, and borers; 2. Gall-makers on *Aster* Compositae (one in *Senecio* Compositae). The male genitalia tend to split the first type up into sections. The gall-formers are likely a homogeneous group from the male genitalic standpoint, but by that means are not necessarily separated as a series from others which are not gall-formers. I hope eventually to figure the majority of the California species. References under the following descriptions are not intended to be complete, neither are the remarks on bionomics.

There are several notable features in which the species of *Gnorimoschema* herein figured resemble each other. These are: Form of adult palpi; wing veination; female genitalia. The pupae of all of these are very similar. The larvae have the frontal seta moved centrad toward the frontal punctures and away from the suture; the prothoracic shield is widely divided centrally into subtriangular halves; seta VIIc of A2 is drawn inward from setae VIIa and b; there is one accessory seta on the prolateral part of the anal proleg in the lower series setae; no anal fork. At least part of these features are not possessed by other larvae of the genus.

Gnorimoschema operculella (Zeller)

(See Plate I)

Gelechia operculella Zeller, Verh.Zool.-Bot. Ges. Wein, 23, p. 262, 1873.

Phthorimaea operculella (Zell.) Meyrick, Ent. Mo. Mag. 38, p. 103, 1902.

Phthorimaea operculella (Zell.) Busck, Proc. U. S. N. M. 25, p. 821, 1903.

Phthorimaea operculella (Zell.) Busck, Proc. Haw. Ent. Soc. 7, p. 171, 1928.

Gnorimoschema operculella (Zell.) Busck, Proc. Ent. Soc. Wash. 33, p. 60, 1931.

The adult of this species is 15 to 18 mm. in wing expanse. The palpi are expanded anteriorly almost the whole length of the second joint and the terminal joint tapers regularly. The forewings are generally of a spotted tan color. The male genitalia are covered dorsally by a plate with yellow setae or seta-like scales and there are lateral recurved tufts of setae. The male has the well-known scale tuft from the hindwing costa, modifying the veination. The male genitalia proper are extinguished by the elongate, narrow tegumen and broad tongue-like uncus, with elliptical gnathos; the harpes are unforked apically.

The pupa is 5½ to 6 mm. long and with a small cremaster.

The larva is 10 to 11 mm. long. Head black to brown, first thoracic segment tending to be pinkish or light brown with shield more or less blackened; the rest of the body is dirty cream-white except when in prepupal stage when pink is unevenly overlaid throughout. Body tubercles small, dark; setae of moderate length. Suranal plate yellowish, often with darkened areas. Central proleg crochets 24 to 27, in complete biordinal circle, weakened outwardly; anal proleg crochets about 20, in complete biordinal series.

Larval structure: Head not flattened, slightly retracted, with adfrontal setae nearer each other than the second is to the apex of the adfronal sclerite; frontal setae nearer frontal punctures than to frontal suture; line from seta O_2 to A_3 through anterior side of ocellus I. Mandible with six teeth, the first small and

drawn toward base, the second not nearly reaching the length of the third, the sixth pointed. Meso- and metathorax with Ia and Ib separate; setae IIa and IIb narrowly separate. Tarsi spinulate. Segment A2 with seta VIIc separate from setae a and b. Seta III on A8 dorso-anterior to spiracle. Seta VI on A9 associated with or near to setae IV and V. One accessory seta on anal proleg in "b" series.

This species, the Potato Tuber Moth, is rather generally distributed, perhaps more plentiful to the south. It feeds on several species of Solanaceous plants.

Gnorimoschema lycopersicella (Busck)

(See Plate II)

Phthorimaea lycopersicella Busck, Proc. Haw. Ent. Soc. 7, p. 171, 1928.

The adults of this species are 8 to 12 mm. in wing expanse. The palpi are expanded on the upper three-fourths of the front side of the second joint; the terminal joint tapering abruptly at the tip. The forewings are nondescript dull tan with slight blackish dots and often with some faint yellowish or ochreous streaks. The male terminalia possess no yellow scales above nor tufts at the side of the genitalia. There is a scale tuft along the costa of the male hindwing modifying the veination. The male genitalia are distinguished by a short triangular tegumen, narrow, spine-like uncus, oval gnathos with a blunt setiferous secondary projection at its tip; the harpes are forked apically.

The pupa is about 4½ mm. long with a very small cremaster.

The larvae are up to 7 mm. in length when full grown. Head yellowish or brown, with black side lines not broadly reaching eyes; hypostomal sclerite black anteriorly. Body gray on green with a subdorsal and lateral row of purple spots and thorax generally purplish. Thoracic shield yellow with posterior and Suranal plate yellowish with some slight dark marks. Central proleg crochets in incomplete circle, broadly broken on outer side. 13 to 16 in biordinal series Anal proleg crochets 10 to 14 and in complete biordinal series.

Larval structure: Head quite flattened, considerably reduced in size and partly retracted; adfrontal setae nearer each other than upper seta is to apex of adfrontal sclerites, adfrontal sutures abruptly converging in front of occipital foramen; frontal setae nearer frontal punctures than to frontal sutures; line from seta O_2 to A_3 usually between ocelli I and II; mandible with six teeth, the first reduced and drawn basally, the sixth pointed. Prothoracic shield with wide central separation. Setae Ia and Ib on meso- and metathorax rather widely separate; setae IIa and IIb also rather widely separate but not quite as far. Tarsi partly spinulate. Segment A2 with seta VIIc drawn centrally from a and b. Seta III on A8 dorsal and slightly anterior to spiracle. Segment A9 with seta VI united on same tubercle with IV and V, or near. One accessory seta in "b" series of anal proleg setae.

The Tomato Pin Worm is now found throughout much of southern California. I have a reared series of adults from tomato and potato leaves taken in the Shafter district of Kern County on March 26, 1934, by B. L. Fox of the Kern County Agricultural Commissioner's office. One adult before me was taken at light near a restaurant and grocery store at Mt. Hermon, Santa Cruz County, but likely does not represent an established infestation. No tomatoes are grown in that neighborhood, but neither is there a restriction to shipping infested tomatoes from Southern California. Due to Mr. Busck's method of including excellent structural figures with his descriptions, we know exactly what the typical *lycopersicella* is.

The following is a synopsis of part of the interspecifically variable structures of four species of *Gnorimoschema* infesting Solanaceae in California:

Gnorimoschema operculella Zell.

Adult 16 to 18 mm. wing expanse; forewing brownish or dull light tan with dark dots; male hindwings with costal scale tuft; male terminalia yellow above and with recurved lateral scale-tufts. Male genitalia with moderately long slender tegumen; uncus tongue-like, as broad as tegumen; harpes simple, incurved apically; aedoeagus moderately long and slender. Pupa 5½ to 6 mm. long, brown; wings extending to sixth segment, cremaster a small up-curved spine. Larvae 10 to 11 mm. long when grown, head brown with blackish infusions to blackish-brown; thoracic shield usually blackish, with remainder of first segment pinkish-brown; remainder of body sordid cream. Thoracic legs blackish. Head not flattened nor appreciably retracted, rounded; mandible

with first tooth small and drawn toward base, second not nearly as long as third, sixth tooth pointed; line from seta A_3 to O_2 through rear part of ocellus I. Body tubercules rather small, dark. Setae IIa and IIb on meso- and metathorax quite close. Central proleg crochets in complete biordinal circle, weak outwardly, 20 to 24. Seta III on A9 slender and on minute tubercle; seta VI on A9 near to or associated with IV and V. Anal proleg crochets in complete biordinal series, 16 to 20: Larva a root and stem borer, possibly also in fruits occasionally.

Gnorimoschema plaesiosema (Turner).

Adult 15 to 18 mm. wing expanse, wings brownish-gray with black mark beginning at costal fifth, running obliquely to center of wing and thence narrowing toward apex; male without sex tufts; male genitalia with short, broad truncate uncus projected somewhat at sides, harpes triangularly flanged apically, anellus with a central long, black spike, aedoeagus long, slender, forked. Pupa about 6½ mm. long, brown, cremaster an almost minute spine. Larva 11 to 12 mm. long, head light brown, body yellowish with pink spots forming five broken lines on dorsal half of abdomen; thoracic legs light brown; head quite convex, mandible with tooth I minute, tooth II almost as long as second, tooth VI blunt and broad, line from seta O_2 to A_3 through rear of ocellus I; body tubercles rather large, light brown; central proleg crochets in complete biordinal circle, weak outwardly, 22 to 25; seta III of A9 strong and on moderate sized tubercle, seta VI of A9 absent; anal prolegs sometimes with more than one accessory seta in "b" series, crochets uniordinal 13 to 15. I shall analyze this species by means of figures in a later installment.

Gnorimoschema striatella (Murtf.).

Adult 11 to 12 mm. wing expanse, forewings light brown, streaked darker brown and smoky; male with costal hindwing scale-tuft, and tufted terminalia; male genitalia with uncus broad and considerably expanded laterally at apex with a central point dorsally, harpes broadly triangularly expanded at apex, aedoeagus slender, shorter, one central upper short fork. Pupa about 5½ mm. long, brown, wings extending to fifth segment, cremaster a comparatively large up-curved spine. Larva 8 to 9 mm. long, head and shield black, first two thoracic segments overlaid dull purplish-brown, body greenish-yellow with five reddish longitudinal lines on dorsal half of last thoracic segment and abdomen; thoracic legs blackish; head rather rounded, first mandibular tooth small, drawn basally, second somewhat shorter than third, sixth tooth short, broad and blunt, line from seta A_3 to O_2 cutting front line of ocellus I; body tubercles small, dark; central proleg crochets hardly biordinal, in circle broken on outer side, 14 to 16; seta III of A9 slender but with some sclerotinization on tubercle, seta VI of A9 associated with IV and V; anal proleg crochets in complete uniordinal series, 10 to 12. Larva a leafroller and fruit borer.

Gnorimoschema lycopersicella (Busck).

Adult 7½ to 11 mm. wing expanse; forewing nondescript tan, slightly dark spotted; male hindwing costa tufted; male genitalia with spine-like uncus, harpes forked apically, aedoeagus moderately long and slender, bulbous basally. Pupa about 4 to 4½ mm. long, brown; wings extending to sixth segment, cremaster a very small spine. Larva 5½ to 7 mm. long; head greenish-yellow or yellow. lined black at sides, body light gray on green, tapering rather abruptly at both ends and flattened; thoracic shield body color, white centrally, black on posterior and lateral margins; meso- and metathorax mainly infused deep purple; abdomen with large, deep purple spots on each segment on dorsal half in two rows, one subdorsal, one spiracular; some white on dorsum, especially on thorax; suranal plate infuscated; thoracic legs black. Head decidedly flattened and half retracted with epicranial halves extended to rear more than in other three species; frons, including adfrontal sclerites, broad, suddenly narrowed behind; first tooth of mandible drawn toward base but of moderate size, second tooth not nearly as long as third, sixth tooth sharp pointed; line from A_3 to O_2 usually between first and second ocellus. Body tubercules of moderate size. Setae IIa and IIb on meso- and metathorax almost as widely separated from each other as are setae Ia and Ib. Central proleg crochets in biordinal circle broadly broken outwardly, 13 to 16. Seta III on A9 slender and on small tubercle; seta VI on A9 associated with IV and V or narrowly separate. Anal proleg crochets in complete biordinal series, 10 to 14. This larva is much more specialized for leafmining than any of the others included in this paper; also a fruit borer.

Gnorimoschema potentella Keifer, new species

(See Plate III)

Alar expanse 9 to 11 mm. Second palpal joint dull whitish, with two lateral bands and brush of fuscous infusion; terminal joint dark fuscous with a lighter annulus above base and another below tip. Face except sides whitish; head above with light scales infuscated just below tip. Antennae with scape infuscated and funicle alternating darker and lighter annuli. Thorax as head but often with light ochreous tinge at apex and patagia tips. Forewings rather narrow, and giving gray effect; underlying color dull whitish covered by general dark fuscous irroration and some inconspicuous ochreous longitudinal streaks. Ochreous streak within costa from base to nearly ½. Ochreous streak in plication to plical stigma at 1/3. Stigmata usually distinct as blackish dots; first discal slightly beyond plical; second discal at about ⅔, both more or less associated with ochreous. Outer ochreous streaks appar-

ently unorganized, perhaps following veins to some degree. Apical part of wing darker and cilia gray. Hindwing light gray, cilia, lighter. Abdomen light gray, tip whitish or whitish ochreous, midventral area yellowish-white edged fuscous. Legs yellowish-white, fuscous irrorated leaving white annulae and segment tips; hind legs lighter. Males with no sex tufts. Most females tending to be lighter in color. Male genitalia compact; tegumen moderately short and narrowing; uncus broad, triangular, bluntly pointed; gnathos spoon-shaped; harpes reaching to apex of uncus, stout, incurved at tip; anellus a pair of posterior projections below aedoeagus; vinculum projecting a short distance anteriorly, broadly truncate; aedoeagus of moderate length, enlarged basally. Female genitalia with simple curved spine signum; ostium broad, anterior apophyses rather slender and tapering.

Type, male, collected in San Francisco, California, February 13, 1933, from *Potentilla californica* C & S. as larva, the adult emerging March 3. Allotype, female, collected in same area and on same host, February 10, 1934, the adult appearing March 14. Twenty-nine designated paratypes nearly all of which were collected February 10, 1934, emerged soon after as adults. As well as the San Francisco series, I have two light trap adults from Pasadena, September 21, 1934. This species is similar to the eastern *G. ochreostrigella* Chamb. but the male genitalia are not identical. For instance, the aedoeagus of the eastern form is distinctly longer and the harpes project considerably beyond the uncus.

Pupa about 4½ mm. long, dark brown; wings projecting to sixth abdominal segment and closely appressed to ventral side of segment; cremaster a tubercle.

Larva about 8 mm. long when grown. Head brown, unevenly blackish infuscated. Shield fuscous, darkest in a band just within posterior margin extending to sides. Body green; tubercles small, brown to fuscous. Thoracic legs dull brownish. Suranal plate infuscated. Central proleg crochets in small biordinal circle, 11 to 13, anal proleg crochets weakly biordinal, unbroken, 7 to 10.

Larval structure: Head not flattened but partly retracted; adfrontal suture wide, enclosing an area almost squarely truncate behind; adfrontal setae about as near each other as the upper is to frons apex; frontal seta half way between puncture and suture; line from seta A_3 to O_2 through front part of ocellus I; mandible with first tooth fairly large, drawn toward base, second not nearly attaining length of third, sixth broad with suggestions of three subdivisions. Meso- and metathorax with setae IIa and IIb on compound tubercle. Thoracic legs rather short and stout, tarsi weakly spinulate. Segment A2 with seta VIIc separated from a and b. Seta III on A8 dorso-anterior and close to spiracle. Seta III on A9 slender and on minute tubercle; seta VI on A9 associated with IV and V. One accessory seta on anal proleg.

The larva of *potentella* is a leafminer, usually tying and mining a succession of leaflets along the *Potentilla* leafstalk. The larvae of this species can only be collected as far as I know in February.

Gnorimoschema neopetrella Keifer, new species

(See Plate IV)

Expanse 12 to 13 mm. The scales on all parts of these moths are usually conspicuously white-tipped. Second palpal joint long, with large brush, white except for uneven light fuscous infusion in brush and on outer side; terminal joint much shorter than second, rough, expanded at base and tapering, white, some fuscous infusion, especially on outer side. Face white; head above slightly mottled, antennae brown-fuscous with alternate lighter wings. Thorax white infused light fuscous or ash color. Forewings light ashen color, the scales infused fuscous below tip and again tipped white, giving light brown-gray effect. Scattered slightly ochreous scales especially on dorsum. An almost faint oblique dark shade from costal ¼ ending in general dark central coloration. Plical stigma blackish at about 1/3; first discal same, somewhat beyond plical and half way between it and dorsum; second discal at 2/3 in center of wing; stigmata tending to be surrounded by white. Apex of wing with some slight marginal dark spots; cilia whitish. Hindwings fuscous cilia lighter. Abdomen whitish, yellowish to ashen infusions, especially toward base, mottled fuscous or brownish on sides below. Legs white with considerable fuscous irroration. No male sex tufts. Male genitalia: Tegumen compact; uncus visor-shaped apically; gnathos a short curved hook; harpes moderately stout, sinuate; anellus a pair of diverging lenticular lobes; vinculum elongated anteriorly into a long, narrow process; aedoeagus long, moderately stout, bent and enlarged basally. Female genitalia with long slender ovipositor; signum a large heavy recurved spine, serrate on outer side of large end.

Type, male, collected by the writer in the hills just above and west of Alma, Santa Clara County, September 1, 1933. Allotype, same data, collected August 30. Thirty-six designated paratypes bear this same data. I am indebted to Mr. Busck for the opinion that this is a new species near *Gnorimoschema petrella Busck.* The specimens were taken flying in dry grass and weeds on one little knoll. The host plant is unknown.

Referring again to the "Genitalia of the British Tineina," we note that Dr. Pierce could not include in the genus *Gelechia* many of the numerous species previously referred thereto. Thus the old conception of this particular genus is now on the way out, and the organization of the North American species only awaits someone with proper facilities. I have been studying the various stages of California species which can serve as examples of certain genitalic groups heretofore referred to *Gelechia.* Two of these are here figured with larva and pupa. The male and female genitalia of the species with the *Gelechia*-type of palpi and veination, seem to show a minimum of characters in common among the groups into which they fall. In part of the instances, the female genitalia which tend to have more conservative features than the male genitalia, indicate affinity, and in others they do not. Let it be here suggested, mainly on the basis of species to be figured in future installments, that the pupal stage may be an important key to taxonomic interpretation of the genital characters.

"Gelechia" eldorada Keifer, new species

(See Plate V)

Expanse 15 to 16 mm. Second palpal joint dull whitish, irrorated dark fuscous, slightly more so at base and before apex, brush large and longest at base, infused fuscous; terminal joint rather white, but unevenly blackened except slightly yellow tip. Face dull whitish-brown, the top of the head infused fuscous; antennae blackish with sparse lighter irroration and broken whitish annuli. Thorax dark fuscous with a decided brown tint. Forewings white at scale bases, but most scales rather heavily infused a dark to blackish-fuscous; area from base to fascia, especially the basal ⅓, with irregular shades of chestnut-brown, giving the inner ⅔ a brown cast. Stigmata large dark spots, hardly contrasting with wing color: plical at 1/3 first discal very slightly past plical, second discal before 2/3. Antapical fascia narrow, almost light brown, zig-zag from first costal cilia to tornus, the central half of the fascia forming an outward pointing angle. Apical area of wing dark, almost black. Cilia gray, irrorated black and often a black line around apex. Hindwings gray, cilia brownish-gray; male with yellow costa hairpencil from toward wingbase. Male also with elongate scales from forewing frenulum hook. Abdomen brownish-gray, whitish mid-ventrally. Legs whitish, irrorated and overlaid black except segment apices; hind-legs with yellowish-brown infusion in lighter areas on tarsi. Male genitalia protected ventrally by characteristic expansible crenulate membrane, supported laterally by stiff incurved projections, this membrane intimately connected to the vinculum; tegumen a V-shaped structure with a linear down-curved, pointed uncus at its apex; gnathos absent; harpes rather short, tubular, curved ventrally and tipped with an incurved spine; anellus apparently entirely membranous; vinculum extending anteriorly as two converging narrow bands; aedoeagus rather long, slender, enlarged basally and with curved ribbon-like sclerites apically, deciduous corunti as slender curved spines. Female genitalia with moderately long ovipositor; ductus bursae strengthened for some distance anteriorly from ostium by a pair of rods; signum, a small plate bearing four spines at corners.

Type, male, collected as larva on *Artemisia vulgaris* at Missouri Flat near Placerville, California, May 28, 1935, the adult emerging June 22. Allotype, female, same data except collected June 10, with adult July 8. Fourteen paratypes, ten from the above locality and four from Mark West Springs, Sonoma County; all from the same host. This species belongs in the group containing *monotaeniella* Chamb., *paraplutella* Busck, *leucaniella* Busck, *eriogonella* Clarke, *rigidae* Clarke, *moreonella* Busck, and others. The male uncus and female

signum are perhaps the most characteristic adult features of these species though the signum is shared with another genitalic series (see Pierce). The spine-tipped harpes are not consistent through all species, as *moreonella* Busck and another undetermined species do not possess this structure.

Pupa 7½ mm. long, brown: wings reaching to fifth abdominal segment; abdomen somewhat attenuate and segments 5, 6, and 7 flexible; seventh segment ringed on posterior margin with a hair fringe, discontinuous mid-dorsally and weakened mid-ventrally; cremaster present as prominent spine.

Larvae up to 13 mm. long have been examined. Head black; shield black; prothorax dark; remainder of body cream-white: pro- and mesothoracic legs black, metapods light brown; tubercles rather small, black; suranal plate fuscous; central proleg crochets about 40 in complete partly triordinal circle; anal proleg crochets in complete partly triordinal series, 24-26.

Larval structure: Head with area delimited by adfrontal sutures acute behind; second adfrontal seta nearer frons apex than adf_1; frontal setae by frontal sutures and remote from frontal punctures; ocelli small, well spaced; line from seta O_2 to A_3 past rear edge of first ocellus; second antennal joint spinulate; first mandibular tooth minute and drawn toward base, last two teeth appressed. Thoracic shield narrowly divided in center, each half large and subquadrate; prespiracular wart large and elongate; setae Ia and Ib on meso- and metathorax separate, the setae IIa, IIb, also separate but approximate; tarsi partly spinulate. Tubercle VII, segment A8 unisetose. Setae III, IV, V, and VI on segment A9 close together, seta III slender and on small tubercle, seta IV and V on compound tubercle, seta VI small, on small separate tubercle. No anal fork. Two or three accessory setae in prolateral position in "b" series of anal proleg setae. Larva a leaftier. Described from two larvae.

The systematic position of this species and the series it represents is rather obscure from the genitalia. However, the pupa, adult labial palpi, and veination, and general larval makeup are quite similar to California species which have genitalia falling in the typical *Gelechia* group, particularly *Gelechia desiliens* Meyr.. It is noted with much interest that the only British species of this group, *velocella* Dup., is tentatively referred to the genus *Epithectis* by Dr. Pierce.

"Gelechia" diversella Busck

See Plate VI

Proc. Ent. Soc. Wash. Vol. 18, p. 149, 1916.

Alar expanse of adult 15 to 17 mm. General color a reddish-brown or dull brick-red. Palpi long, rather slender, the second joint rough anteriorly but hardly with a brush in the *Gelechia* sense. Male antennae noticeably thickened and darker than the thinner female structure. Male genitalia: tegumen rather elongate, slender, uncus truncate and with an apical scale-tuft, gnathos a hook; costa of harpes slender lanceolate, sacculus longer, slender, somewhat down-curved and enlarged at apex: anellus a pair of elongate spinose parallel processes; vinculum subulate, aedoeagus long, slender, tubular, little enlarged or ramified apically. Female ovipositor moderately elongate, ductus bursae sclerotinized for short distance anteriorly in the shape of a tube; signum absent.

Type locality, San Diego. The specimens from which this study was made were related from *Lotus* sp. (*scoparius?*—wild alfalfa), the larvae collected during April in the Deer Creek district, El Dorado County. I have also one adult from San Diego with rather faded livery, and two larvae collected recently (April 19, 1936) near Pasadena.

Pupa 6 to 6½ mm. long, pale brown; labial palpi slightly in evidence at base, maxillary palpi extending almost to tip of abdomen, hindlegs and wings extending to tip of abdomen, antennae extending beyond tip of abdomen; whole body tapering noticeably from base of forewings which are almost as long as abdomen. (The identity of this pupa might seem entirely wrong were it not for male genital structures shownig through both of my specimens.)

Larvae up to 11 mm. long have been examined. Head light yellowish-brown with some dark marks to the rear; thoracic shield rather light yellow with the rear half or ⅔ darkened; body greenish with six rather broken and irregular pinkish longitudinal stripes down dorsal half; body tubercles small, dark; suranal plate yellowish-green, slightly dark spotted; no anal fork; central crochets 28 to 30, in complete biordinal circle weaker outwardly; anal proleg crochets about 24, in complete biordinal series.

Larval structure: Seta adf$_2$ near front apex; seta F not very close to frontal suture but nearer there than to frontal puncture; line through setae A_2 and O_2 through upper rear ocellus I; six-toothed mandible with first tooth drawn toward base. Thoracic shield with wide central division, the halves weak and subtriangular, prespiracular wart small; tarsi lacking spinules; setae IIa, IIb, on compound tubercles on meso- and metathorax. Tubercle VII on A8 is bisetose. One accessory seta in prolateral position in "b" series on anal proleg. Larva a leaftier at tips of shoots, living in a frass tube. Two of the five larval specimens studied have both prespiracular warts bisetose.

The taxonomic position of this species (and I hazard including *variabilis* Busck, *puertella* Busck, *longicornis* Curt., and numerous others) may be cleared up by the pupa of *loticola* to the extent that it does not appear to be a near relative of the *Gelechia* complex. The adult palpi really indicate this, but the veination does not. The larva is not convincingly different from *Gelechia*-type larvae producing pupae with a seta-fringe on segment seven, except that the prothoracic shield is of a very different character, the prespiracular wart is small, the crochets are biordinal, and there is never more than one accessory seta on the anal proleg. The possession of a bisetose tubercle in position seven on the eighth abdominal segment has its counterpart in the *Gelechia* complex in the larvae of the "curtain-fringe" series. The larva of *diversella* superficially resembles the larva of *demissae* Keifer, of the "curtain-fringe" group, and like it pupates in the ground, but the adults do not delay as long in appearing. The presence of labial palpi on the pupa is an unusual feature for the family.

Dr. Pierce tentatively refers the British representatives of this *variablis* group, namely, *solutella* Zeller and *longicornis* Curt., to *Epithectis,* showing that they cannot be associated on genital characters with *Gelechia.* It should be noted that what appears to be this same type of uncus and gnathos turn up in the British *Thiotricha subocellea* Stp., if I interpret the figure correctly. In North America *Telphusa acaciella* Busck, may also have the general type of uncus shown by the *variabilis* series.

"*Gelechia*" *dammersi* Keifer, new series

(See Plate IV)

Expanse 16 to 17 mm. Second palpal joint brownish-white, irrorated black on outer side and with brush black except at apex; terminal joint black, slight brownish mottling sometimes a white spot on front margin at $\frac{2}{3}$ and tip lighter or white. Face dull light brown or luteus, the top of head blackened with scales narrowly light-tipped. Antennae black, brown spot on upper scape apex, funicle with contrasting annuli and some white scales. Thorax black, apex brown; thoracic scales slightly white-tipped. Forewings brownish-black, somewhat unevenly so under the microscope, but giving a general black effect to the unaided eye. A narrow streak from wing base on costal side of convex plica extends about $\frac{1}{3}$ length of wing parallel to costa and alternately pure black and luteus; dorsal base light brown with a few black scales as inner edging; often a black plical spot short distance out, with some luteus scales; a spot of black and luteus often just beyond and above this. Plical stigma small, black, and luteus, at almost $\frac{1}{4}$; first discal same, above and beyond plical; second discal with larger black spot and luteus beyond or above at beyond $\frac{1}{2}$; faint brown fascia, angled outward centrally, from just beyond costal $\frac{2}{3}$ to tornus. A few scales scattered over apical area and cilia gray with the basal scales dull white-tipped. Hindwing and cilia gray. Abdomen grayish or fuscous the segments light-tipped above and general brown irroration below with somewhat of a lateral black dash. Legs light brown with considerable blackening except segment apices; hind tibiae mostly light brown with hairs grayish. Male genitalia; uncus spoon-shaped; gnathos a hooked spine; harpes long-lanceolate, reaching almost to uncus apex, sacculus short, fingerlike, setiferous, anellus apparently entirely membranous; vinculum long V-shaped; aedoeagus tubular with nobbed rod from base and expanded apex. Female genitalia with broad ostium and spur-like signum.

Type, male, "Palm Springs, California, April 2, 1933, bred from *Eriogonum inflatum,* C. M. Dammers." Allotype, female, "Perris,

bred, June 20, 1935, C. M. Dammers, collector." Ten designated reared paratypes, from Riverside, Perris, (one labeled "*Eriogonum elongatum*"). All emergence dates are in May and June. One paratype, taken by the writer at light, Newport Beach (Corona del Mar), April 18, 1936. The type, allotype, and six paratypes are the property of the U. S. National Museum. Five paratypes remain here in Sacramento. I take pleasure in naming this little moth for its collector, Commander Charles M. Dammers. This species is described through the courtesy of Mr. August Busck, who states it to be a new species allied to *luteogeminata* Clarke (Can. Ent. 67, p. 251, 1935).

It is again necessary to remark the disposition which Dr. Pierce makes of the only British representative of the group of moths to which *dammersi* belongs. This is *distinctella* Zeller, which he places tentatively in *Telphusa*. This is still another indication of the heterogeneous nature of *Gelechia* as previously understood. The group to which *dammersi* belongs is very largely represented in North America and all species have been referred to *Gelechia*. The female signum of *dammersi* is aberrant and variable. The harpes of the male genitalia are also variable in length and thickness, but the other structures, notably the aedoeagus, seem static.

Argyrolacia Keifer, new genus

(See Plate IV)

Labial palpi rather long, recurved, second joint rough beneath; terminal joint about as long as second, tapering, slender, acute. Antennae about ¾. Forewings broad-lanceolate, outer dorsal margin slightly sinuate, wing tufts along plica and within dorsal margin only; anal vein bifurcate basally, vein 2 weak, almost obsolete, 3 and 4 approximate at angle and running outward to wing margin, 6 very close to or connate with 9, 7 and 8 out of 6, 7 and apex of 6 weak, 11 from before middle of cell. Hindwing a little less than 1, apex produced, termen slightly sinuate; 3, 4, and 5 equidistant with 4 from angle, vein to base of 6 straight and very weak, 6 and 7 parallel, 7 obsolete toward base. Male genitalia symmetrical, with two-pronged uncus, gnathos a short, broad projection; harpes recurved dorso-ventrally only and reaching to beyond uncus base; anellus a Y-shaped structure in ventral view, broadly flanged in lateral view; aedoeagus with slender down-curved rod attached to vinculum, the aedoeagus proper curved at base and diagonally truncate apically, the resulting point somewhat up-curved. Female genitalia with elongate ovepositor, ostium opening into a moderately short sclerotinized tube, anterior apophyses fairly long and slender, signum roughly diamond-shaped with opposed inward projecting flanges and serrate edges.

Genotype as follows:

Argyrolacia bifida Keifer, new species

Expanse 11 to 12½ mm. Palpi white; second joint black on outer basal half with a more or less distinct black spot beyond, slightly fuscous on inner side toward base; terminal joint with a black annulus at ⅓ and another before tip. Face shining white, often blackish at sides and below; head above dotted black. Antennal scape black, white on front side and narrowly around apex; funicle with lighter and darker annuli. Thorax white, irrorated dark fuscous the patagia not irrorated outwardly. Forewings white but generally irrorated dark fuscous, darker toward costa and shading lighter toward dorsum. Small black tuft at plica base. Outwardly oblique white fascia somewhat irrorated, from just before costal fourth to across plica, some rough scales on inner edge in plica. Two black tufts, one in plica at just beyond ⅓, the other the same distance from dorsal margin, just before tornus. Inwardly angulate whitish fascia, somewhat irrorated, from costa to tornus. Tornal cilia whitish-gray. Hindwings light gray. Abdomen gray, yellowish-white along midventrum and at apex. Legs whitish but overlaid fuscous basally, darkening to black on tarsi, with segment apices white, the hind tibiae fuscous on distal half of outer side and hairs yellowish white. Genitalia as figured.

Type, male, collected as adult at Silver Lake, Amador County (elevation 7,500 feet), flying amongst *Ceanothus divaricatus* Nutt., August 1, 1935, by the writer. Allotype, female, same data. Thirty-

six designated paratypes from same locality, two collected in July, 1933, by D. B. Mackie. The immature stages are unknown but must be attached to this *Ceanothus*.

The principal excuse for establishing this genus is the male genitalia which have a decidedly bifid uncus. The other features of the genitalia might be considered vaguely similar to the symmetrical genitalia of the genotype of *Recurvaria* which is *nanella* Hbn. The uncus of the *nanella* group is "spatulate" and the harpes are curved in part laterally, whereas the harpes of *Argyrolacia* are only curved dorsoventrally. The veination of the typical *Recurvaria* species is noticeably stronger than that of *Argyrolacia* and they have forewing vein 2 well developed. The fact that forewing veins 6 and 9 are approximate or connate in *Argyrolacia* is probably of little moment except that it does not seem to be characteristic of other genera, even in the reduced wings of *Tosca*. The female genitalia of *Argyrolacia* are somewhat similar to typical *Recurvaria*, although the details of the ostium are different. However, (unlike the case of *Gnorimoschema*) this type of signum is characteristic of several genera with distinct palpi and veination, including *Gelechia* in the strict sense.

Deoclona yuccasella Busck

(See Plate VII)

Adult: Expanse 16 to 21½ mm. Entirely ochreous, the forewings darker than the hindwings. Labial palpi ascending and somewhat recurved; second joint but slightly roughened below; terminal joint much shorter than second, slender, porrected in male. Mouth parts rudimentary. Hindwing with peculiar veination, as figured. Male genitalia with tegumen a delicate V-shaped sclerite possessing an apical semidiscal structure, the edge thickly set with short filaments, that evidently functions as a trigger mechanism, by means of a strong fork just ventral to it. The aedoeagus is long, slender, with an apical spine set at a right angle. Other genital homologies difficult to determine. Female genitalia with rather short ovipositor; ostium set on posterior edge of a shield-like plate, which is hooked at rear corners, signum as figured. Abdomen of both sexes with transverse dorsal plates on most of the segments bearing short spines.

Pupa 6½ to 8mm. long, brown; frontoclypeal suture not distinct, labial palpi visible for most of length; maxillae ending at convergence of forelegs; fore femora visible; legs and wings reaching to fifth segment; fifth, sixth, seventh, and possibly eighth segments movable; pronotum with a pair of central tooth-like structures; ridges across dorsum of abdominal segments 5, 6, 7, 8, and 9; no cremaster, hooked hairs.

Larva 12 to 14 mm. long. Head brown, adfrontal sutures not quite reaching foramen; seta A_2 nearer adfrontal suture than seta A_1; mandible triangular, with fourth tooth reduced to a slight swelling. Thoracic shield yellow, widely divided centrally; setae IIa and IIb on meso- and metathorax farther spaced than setae Ia, Ib. Thoracic legs short, stout, only tibiae heavily sclerotinized, outer rear antapical tibial seta sickle-shaped. Body in general white, rather robust; setae II on abdomen nearer than setae I; proleg setae of segments A3 to A6 in same position as setae of seventh group on A2; central prolegs short, stout, crochets short, stout, forming oval figure, about 27, slightly biordinal. Segment A9 with setae I, II, and III, at points of a triangle all strong; setae IV and V not approximate; seta VI absent. Tenth segment rather small, no accessory setae on anal prolegs, setae $VIIb_2$ and $VIIb_3$ displaced laterally; crochets in complete series, about 13.

The pupa of *Deoclona* at once separates the species from any of the known Gelechioid pupae. In Mosher's keys to Lepidopterous pupae, this pupa runs to the Yponomeutoidea. Unfortunately, there are too few Yponomeutoid genera dealt with in this work to help us further in this line of reasoning. The genitalia do not seem to resemble Gelechioid genitalia. Characters to be noted are: Labial palpi, hindwing veination, and genitalia of adult; the pupa as a whole; the adfrontal sutures, thoracic legs, and apical tarsal setae, dorsal body setae, prolegs and setae, ninth abdominal segment, and lack of accessory setae in the

larvae. The larval crochets are at least superficially similar to some Tineidae.

The specimens from which the above descriptions were taken, appeared in pods of *Yucca whipplei* Torr. during the summer of 1935. The pods were collected September 23, 1934, up Big Tajunga Canyon, Los Angeles County. At the time of collection, the pods appeared barren of life and were discarded, but not thrown away. By chance, they were "rediscovered" the next July and were full of caterpillars of three different kinds. The adults of *Deoclona* continued to emerge until cold weather set in. Small *Deoclona* larvae are in these pods after 1½ years, indicating continuous breeding. I have specimens of Yucca pods from Camp Nelson, Tulare County, September 12, 1935, collected by Peter C. Ting, that are infested with *Deoclona,* proving the species to come north of Southern California.

The types and allotypes of species described in California Microlepidoptera IX are deposited in the collection of the California Academy of Sciences, except those of *Gelechia dammersi.* The type and allotype of this species are the property of the U. S. National Museum and will be located there. Paratypes of all species are distributed as far as possible to Miss Annette F. Braun, and the U. S. National Museum. Unless otherwise specified, all material herein treated was collected and reared by the writer.

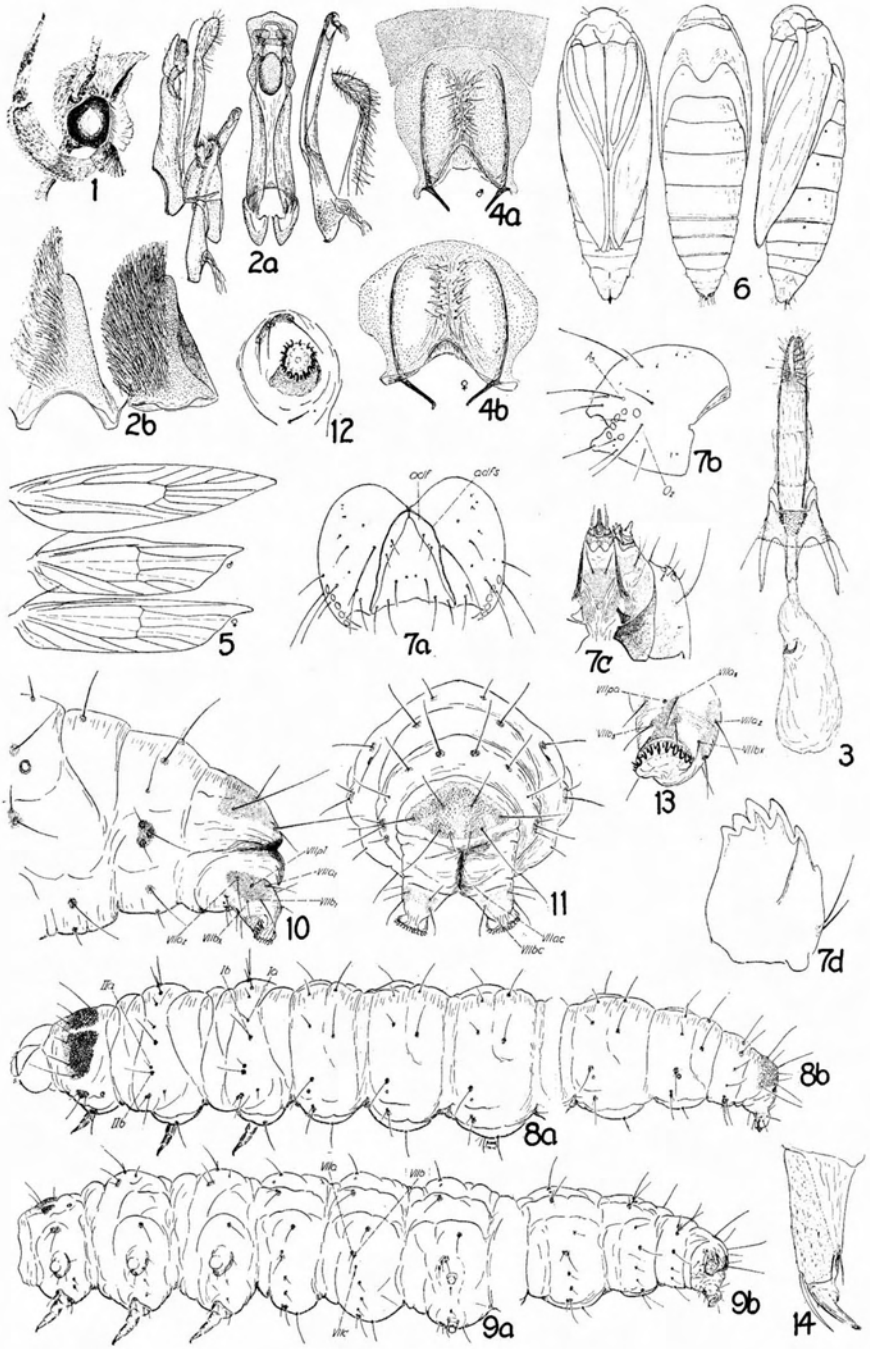

1
2a
4a
6
2b
12
4b
7b
5
7a
7c
3
13
10
11
7d
8b
8a
9b
9a
14
PLATE I

PLATE I

Gnorimoschema operculella (Zell.)

Fig. 1, Adult head, left side. Fig. 2, Male genitalia: Left side, tegumen and uncus from below, aedoeagus, harpe tip from below, respectively. Fig. 2b, Male terminalia, dorsal and ventral plates respectively. Fig. 3, Female terminalia. Fig. 4, Anterior sternal plates: a, male; b. female. Fig. 5, Wings with hindwing sexual differences. Fig. 6, Pupa, three views. Fig. 7, Larval head: a, from in front (adf—adfrontal sclerite, adfs—adfrontal suture); b, left side (A_3 and O_2—setae); c, left side and suboral structures; d, mandible. Fig. 8, Subdorsal view of larva: a, Thorax and first three abdominal segments (Ia, Ib, and IIa, and IIb—subdorsal thoracic setae); b, last four abdominal segments. Fig. 9, Lateroventral view of larva same as 8 (VIIa, b, c, lateroventral setae of A2). Fig. 10, Larva, lateral view of last three abdominal segments (VIIa$_1$ a$_2$—setae of upper series of anal proleg; VIIb$_1$—first lower series seta; VIIbx—accessory seta, VIIpl—lateral sensory puncture). Fig. 11, Larva, rear view of last three segments (VIIac and bc—rear setae of anal proleg). Fig. 12, Proleg of third segment. Fig. 13, Left anal proleg. (VIIa$_2$, a$_3$, b$_3$, bx—setae; VIIpa—anterior puncture). Fig. 14, Left metapod, tarsus and claw, rear view.

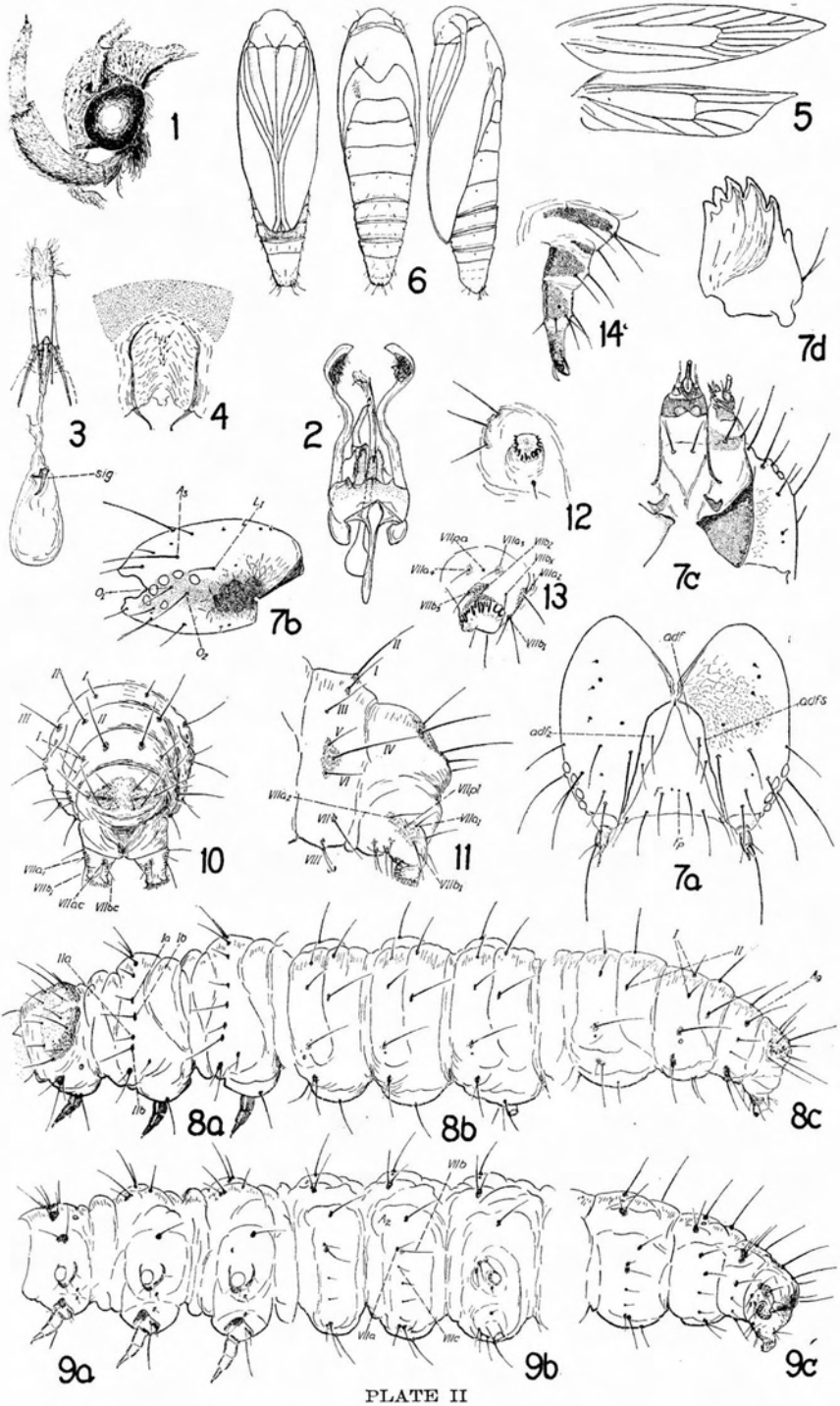


PLATE II

PLATE II

Gnorimoschema lycopersicella Busck

Fig. 1, Adult head, left side. Fig. 2, Male genitalia. Fig. 3, Female terminalia, (sig-signum). Fig. 4, Anterior sternal plate. Fig. 5, Female Wings. Fig. 6, Pupa, three views. Fig. 7, Larval head: a, front view (adf—adfrontal sclerites; adfs—adfrontal suture; adf_2—second adfrontal seta; F—frontal seta; Fp—frontal puncture); b, side view (letters refer to setae): c—suboral structures; d, mandible. Fig. 8, Larva, subdorsal view: a, thorax (Ia, Ib, IIa, IIb, subdorsal setae); b—first three abdominal segments; c—last four abdominal segments (I, II—subdorsal setae; A9—ninth abdominal segment). Fig. 9, Same as 8, lateroventral views (A2 second abdominal segment; VIIa, b, c,—lateroventral setae of A2). Fig. 10, Rear view of last three segments (I, II, III—subdorsal setae; VIIac, VIIbc, $VIIa_1$, $VIIb_1$—anal proleg setae). Fig. 11—Lateral view of last two segments, (I, II, III, IV, V, VI, VII, VIII—setae of A9; $VIIa_1$—first seta of upper and anal proleg series; $VIIb_1$—first lower series seta; VIIpl—lateral puncture of proleg). Fig. 12, Left proleg of third abdominal segment. Fig. 13, Left anal proleg ($VIIa_2$, a_3, a_4—upper series setae; $VIIb_1$, b_2, b_3—lower series setae; VIIbx—accessory seta; VIIpa—anterior sensory puncture). Fig. 14, Left metapod, rear view.

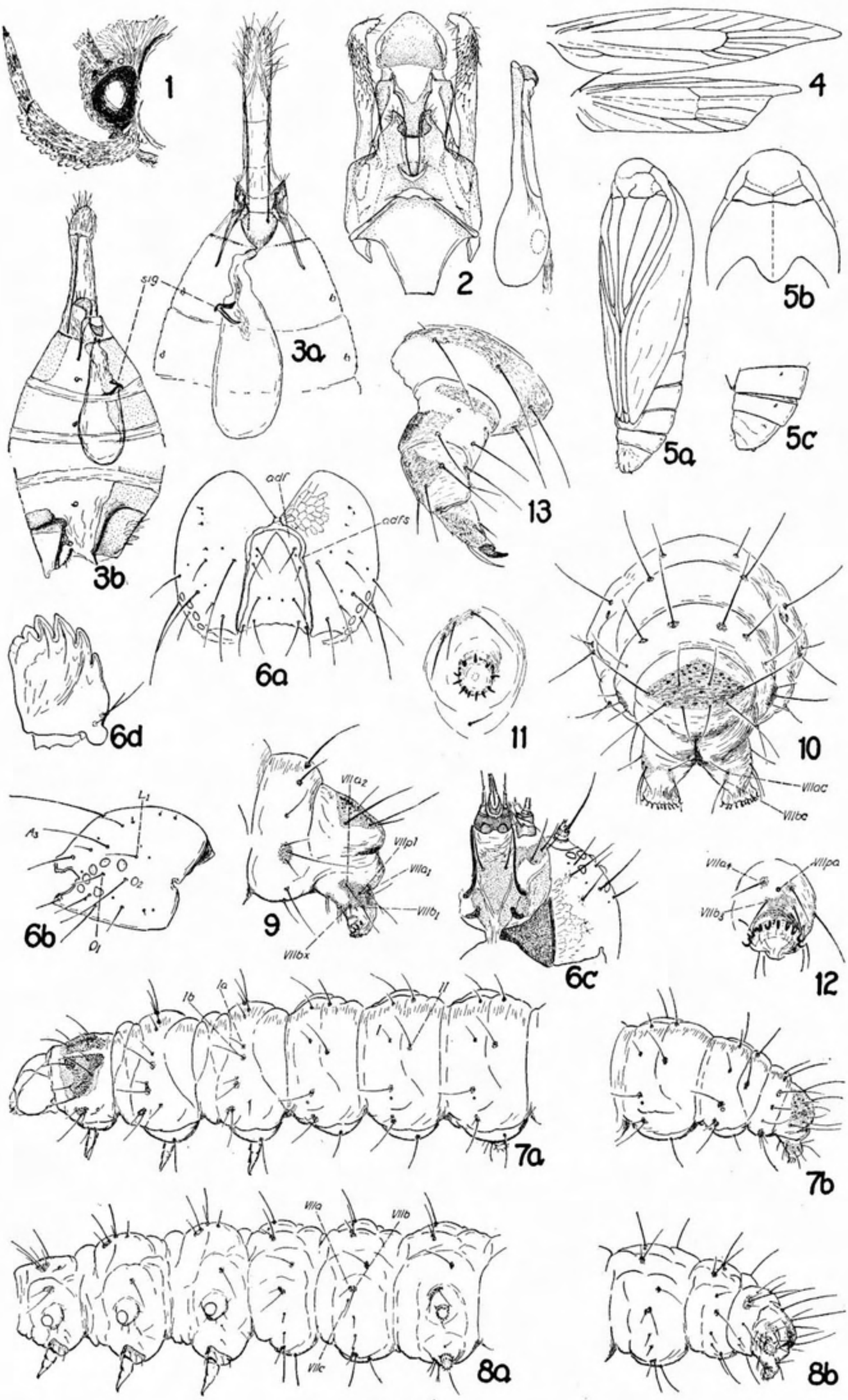


PLATE III

PLATE III

Gnorimoschema potentella Keifer

Fig. 1, Adult head, left side. Fig. 2, Male genitalia, aedoeagus to right. Fig. 3a, Female terminalia, ventral view (sig—signum). Fig. 3b, Same, left side, with first two abdominal segments. Fig. 4, Wings. Fig. 5a, Pupa, lateroventral view 5b. Head and thorax from above; 5c, Left side of terminal segments. Fig. 6a, Larval head, frontal diagram; (adf, adfrontal sclerite; adfs, adfrontal suture). Fig. 6b, Same, left side (A_3, L_1, O_1, O_2—head setae). Fig. 6c, Same, suboral structures and left epicranium. Fig. 6d, mandible. Fig. 7a, Larva, thorax and first three abdominal segments, subdorsal view (Ia, Ib, setae on dorsum of thorax; I, II, setae on dorsum of abdomen). Fig. 7b, Larva, subdorsal view of last four segments. Fig. 8a, Same as 7a, lateroventral view (VIIa, VIIb, VIIc, seventh series setae on A2). Fig. 8b, Same as 7b, lateroventral view. Fig. 9, last two larval segments, left side (VIIa$_1$, VIIa$_2$ VIIb$_1$, VIIbx—setae of anal proleg, first and second in upper series, first lower series and accessory seta, respectively; VIIpl, lateral sensory puncture). Fig. 10, Rear view of last three larval segments (VIIac, VIIbx, caudal setae of anal proleg, upper and lower). Fig. 11, Larval proleg, central series. Fig. 12, Left anal proleg from below (VIIa$_4$, VIIb$_3$, Fourth and third setae of upper and lower series; VIIpa, Anterior sensory puncture). Fig. 13, Larval thoracic leg, rear view.

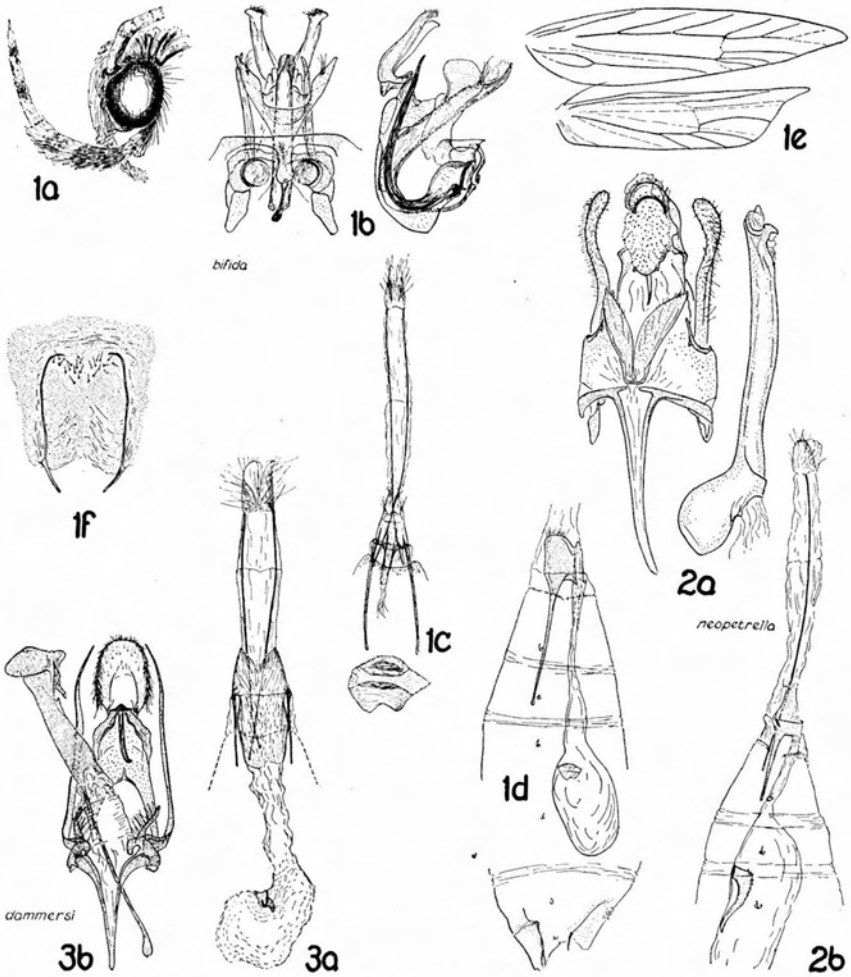


PLATE IV

PLATE IV

Argyrolacia bifida Keifer

Fig. 1a, Adult head, left side. Fig. 1b, Male genitalia, ventral and lateral views. Fig. 1c, Female terminalia, ventral view, signum below. Fig. 1d, female abdomen, left side; ovipositor and third and fourth segments missing. Fig. 1e, Wings. Fig. 1f, Anterior sternal plate.

Gnorimoschema neopetrella Keifer

Fig. 2a, Male genitalia aedoeagus to right. Fig. 2b, Female terminalia, left side.

Gelechia dammersi Keifer

Fig. 3a, Female terminalia, ventral view. Fig. 3b, Male genitalia.

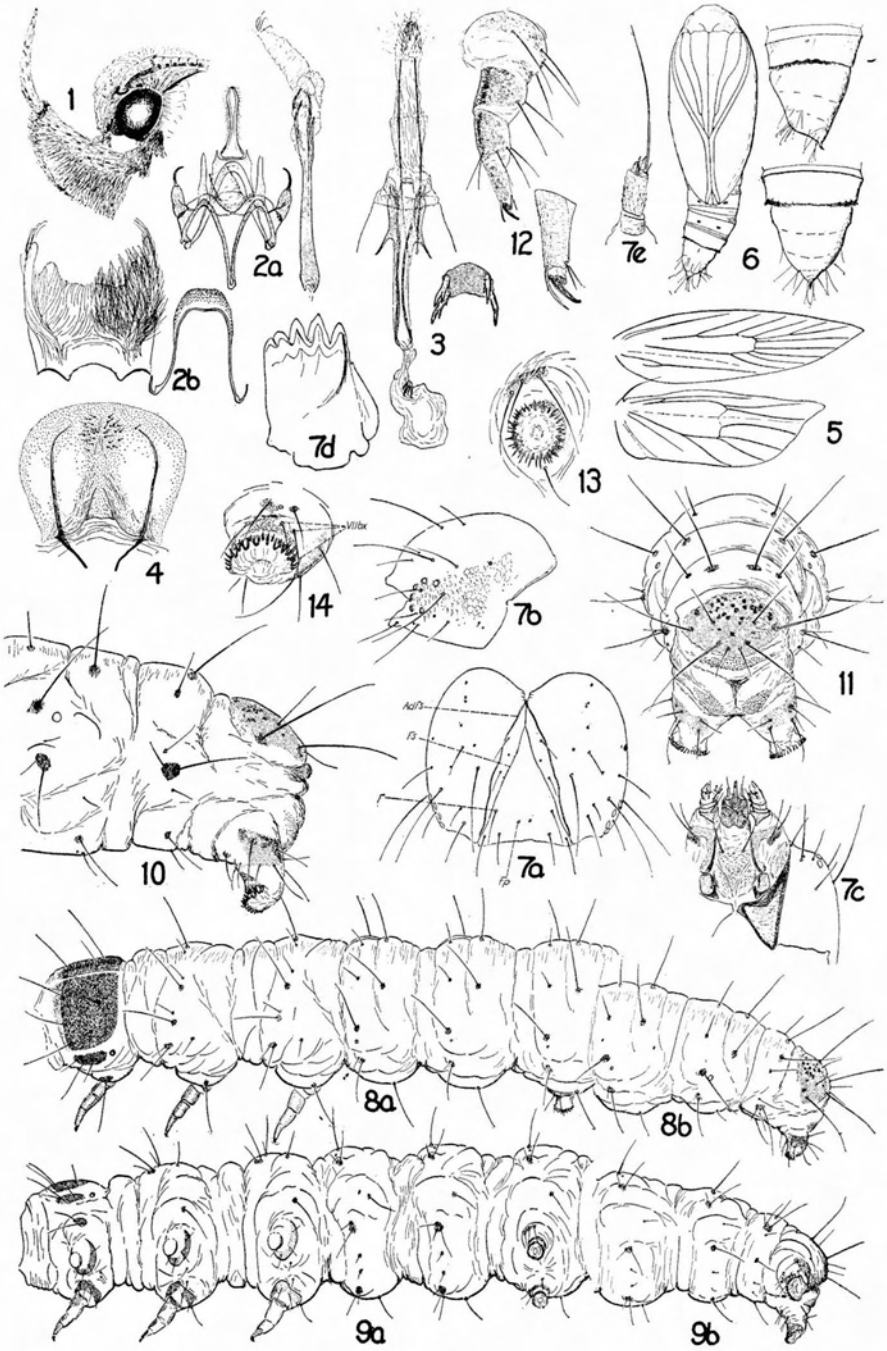


PLATE V

PLATE V

"Gelechia" eldorada Keifer

Fig. 1, Adult head, left side. Fig. 2a, Male genitalia, aedoeagus to right. Fig. 2b, Ventral and dorsal lobes covering male genitalia. Fig. 3, Female terminalia with signum to right. Fig. 4, Anterior sternal plate. Fig. 5, Wings. Fig. 6, Pupa, with lateral and dorsal views of last four segments. Fig. 7, Larval head: a, front view (Adfs, adfrontal suture; Fs, frontal suture; F, frontal seta; Fp, frontal puncture); b, left side; c, suboral structures; d, mandible. Fig. 8, Larva, subdorsal view: a, Thorax and first three abdominals; b, Last four abdominals. Fig. 9, Larva, lateroventral view, same as 8. Fig. 10, Lateral view of last three abdominal segments. Fig. 11, Rear view of last three abdominal segments. Fig. 12, Left thoracic metapod with detail of tarsus to right. Fig. 13, Left proleg of third abdominal segment. Fig. 14, Left anal proleg (VIIbx, accessory setae).

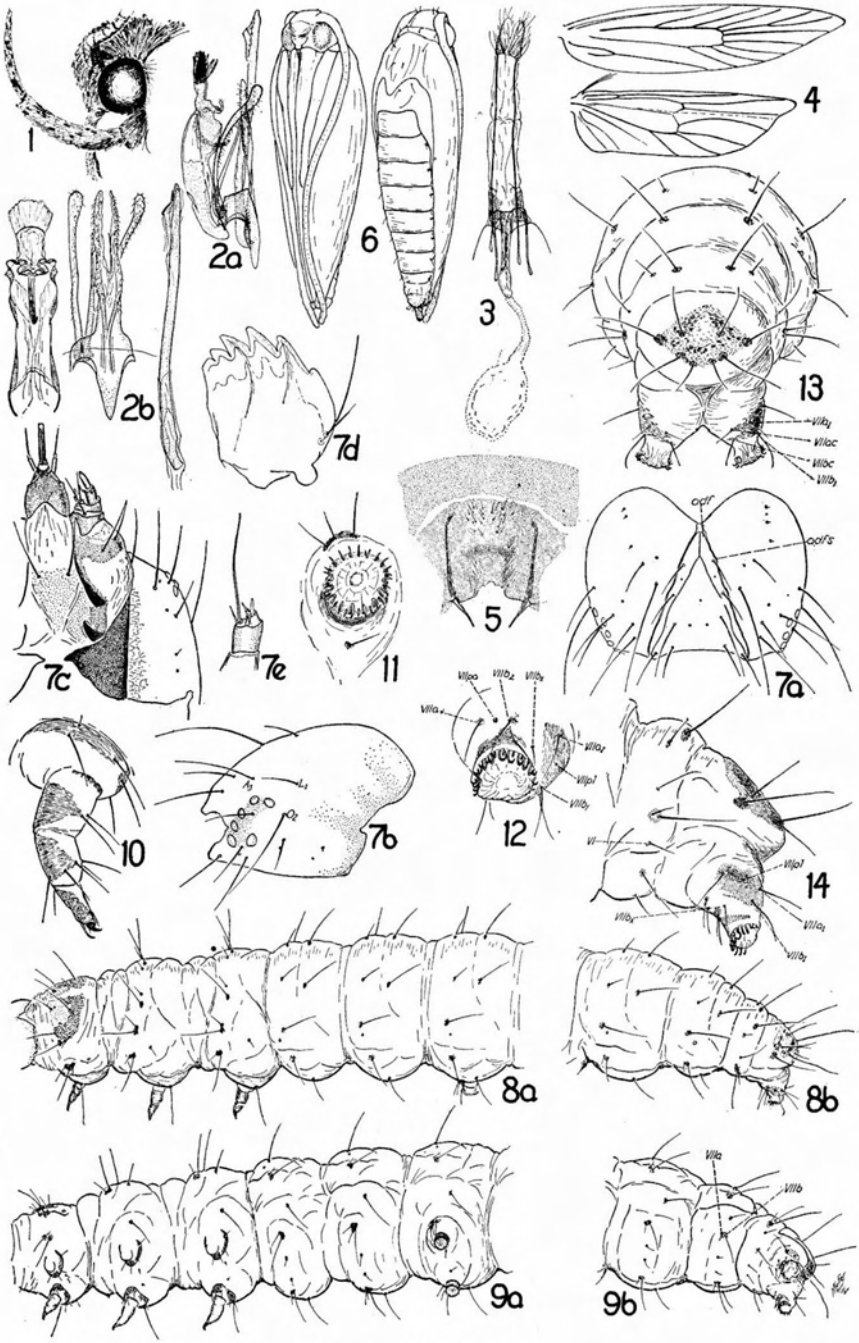


PLATE VI

PLATE VI

"Gelechia" diversella Busck

Fig. 1, Adult head, left side. Fig. 2a, Male genitalia, left view. Fig. 2b, Same, tegumen, etc., harpes; anellus and vinculum and aedoeagus, respectively. Fig. 3, Female terminalia. Fig. 4, Wings. Fig. 5, Anterior sternal plate. Fig. 6, Pupa, lateroventral and subdorsal views. Fig. 7, Larval head: a, front view (adf, adfrontal sclerite; adfs, adfrontal suture); b, lateral view (A_3, L_1, O_2—setae); c, suboral structures; d, mandible; e, antenna. Figs. 8a, 8b, Larva subdorsal view, minus head and segments A4, 5, and 6. Figs. 9a, 9b, Same as 8 (VIIa, b, lateroventral setae of segment A8). Fig. 10, Left larval metapod, rear view. Fig. 11, Left proleg of segment A3. Fig 12, Left anal proleg ($VIIa_2$, a_4—setae of upper series; $VIIb_1$, b_2—Setae of lower series; VIIbx, accessory seta; VIIpl, pa—lateral and anterior sensory punctures). Fig. 13, Last three larval segments rear view (VIIac, $VIIa_1$, VIIbc, $VIIb_1$—Anal proleg setae). Fig. 14, Last two larval segments, left side (VI—sixth seta of segment nine; $VIIa_1$—First upper series seta of anal proleg; $VIIb_1$—First lower series seta; VIIbx—Accessory seta; VIIpl—Lateral sensory puncture).

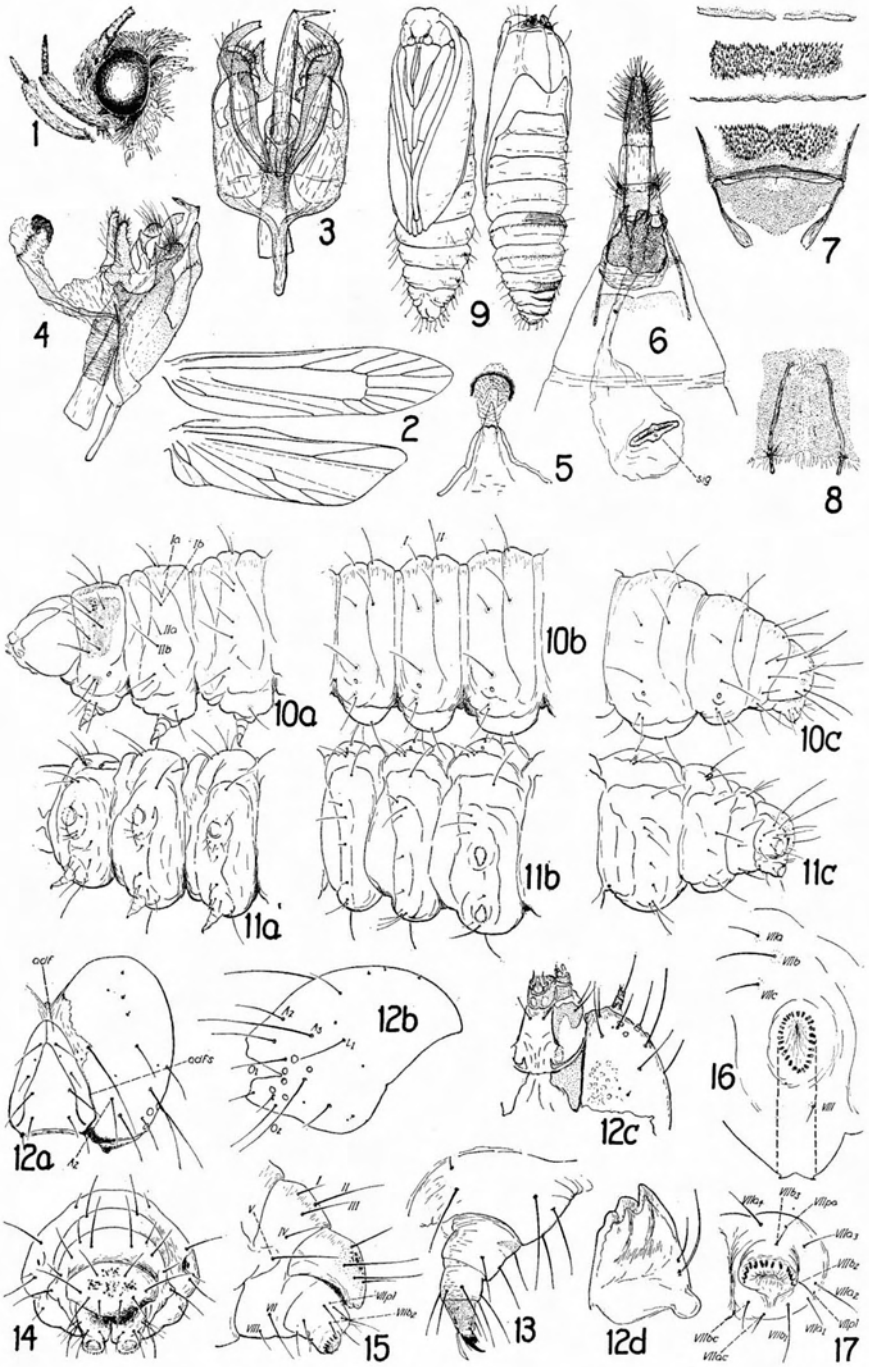


PLATE VII

PLATE VII

Decoclona yuccasella Busck

Fig. 1, Adult head, left side, Male palpus to left. Fig. 2, Wings. Fig. 3, Male genitalia from below. Fig. 4, Male genitalia, left side. Fig. 5, Male genitalia, tegumen and associated structures. Fig. 6 Female terminalia (Sig—signum). Fig. 7, Dorsum of first three adult abdominal segments. Fig. 8, Anterior sternal plate. Fig. 9, Pupa, two views. Fig. 10, Subdorsal aspect of larva: a, Thorax (Ia, Ib, IIa, IIb—subdorsal setae); b, First three abdominal segments; c, Last four abdominal segments. Fig. 11, Lateroventral view of larva, as in 10. Fig. 12, Larval head; a, from in front (adf, adrontal sclerite; adfs, adfrontal suture; A_2, Second anterior head seta); b, Side view with anterior, ocellar and lateral setae designated; c, Head from below; d, Larval mandible. Fig. 13, Rear view of left metapod. Fig. 14, Rear view of last three abdominal segments. Fig. 15, Side view of last two abdominal segments (I, II to VIII—setae of ninth segment; $VIIb_2$—Second seta of lower anal proleg series; VIIpl—Lateral sensory puncture of anal proleg); Fig. 16, Left proleg of third abdominal segment with setae designated and outline of side view below. Fig. 17, Left anal proleg from below (VIIac and VIIbc—rear setae; $VIIa_1$, a_2, a_3, a_4—upper series setae; $VIIb_1$, b_2, b_3—lower series setae; VIIpl and pa—lateral and anterior punctures).